

Claims

WHAT IS CLAIMED IS:

1. A method comprising:
computing a minimum cost path in a stereo disparity model between a scan line of a first image and a corresponding scan line of a second image of a stereo image pair, the stereo disparity model distinguishing between non-fronto-parallel matched pixels in each scan line and occluded pixels in each scan line.
2. The method of claim 1 wherein the computing operation comprises:
computing matching costs for each pixel of each scan line pair.
3. The method of claim 1 wherein the computing operation comprises:
computing matching costs for each pixel of each scan line pair using a windowed matching cost function.
4. The method of claim 1 wherein the computing operation comprises:
altering the matching costs for at least one pixel pair based on whether the pixel pair is determined to be associated with a non-fronto-parallel surface or an occlusion.
5. The method of claim 1 wherein the computing operation comprises:
determining a minimum cost path in the stereo disparity model.
6. The method of claim 1 wherein the computing operation comprises:
applying a cost penalty to a move from an occluded pixel pair to a matched pixel pair.

1 7. The method of claim 1 wherein the computing operation comprises:
2 applying a cost penalty to a move from a matched pixel pair to an occluded
3 pixel pair.

4 8. The method of claim 1 wherein the computing operation comprises:
5 applying a cost penalty to a move from an occluded pixel pair to another
6 occluded pixel pair.

7 9. The method of claim 1 wherein the computing operation comprises:
8 applying a first cost penalty to a move from an occluded pixel pair to
9 another occluded pixel pair; and
10 applying a second cost penalty to a move from a matched pixel pair to an
11 occluded pixel pair, the first cost penalty being different than the second cost
12 penalty.
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14 10. The method of claim 1 wherein the computing operation comprises:
15 applying a first cost penalty to a move from an occluded pixel pair to
16 another occluded pixel pair; and
17 applying a second cost penalty to a move from a matched pixel pair to an
18 occluded pixel pair, the first cost penalty being less than the second cost penalty.
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20 11. The method of claim 1 further comprising:
21 computing a cyclopean virtual image scan line based on corresponding
22 pixels of the scan lines of the first and second images, a disparity of the
23 corresponding pixels being characterized by a minimum cost path of the stereo
24 disparity model.
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1 12. The method of claim 1 further comprising:
2 computing a cyclopean virtual image scan line based on corresponding
3 pixels of the scan lines of the first and second images, wherein corresponding
4 pixels that are matched are projected as a virtual pixel onto the cyclopean virtual
5 image scan line.

6 13. The method of claim 1 further comprising:
7 computing a cyclopean virtual image scan line based on corresponding
8 pixels of the scan lines of the first and second images, wherein corresponding
9 pixels that are averaged to determined a value of a resulting virtual pixel on the
10 cyclopean virtual image scan line.

11 14. The method of claim 1 further comprising:
12 computing a cyclopean virtual image scan line based on corresponding
13 pixels of the scan lines of the first and second images, wherein a non-occluded
14 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel
15 onto the cyclopean virtual image scan line from a background disparity in the
16 stereo disparity model.

17 15. The method of claim 1 further comprising:
18 computing a cyclopean virtual image scan line based on corresponding
19 pixels of the scan lines of the first and second images, wherein a value of a non-
20 occluded pixel of an occluded pair of corresponding pixels is selected as a value of
21 a resulting virtual pixel on the cyclopean virtual image scan line.
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1 16. A computer program product encoding a computer program for
2 executing on a computer system a computer process, the computer process
3 comprising:

4 computing a minimum cost path in a stereo disparity model between a scan
5 line of a first image and a corresponding scan line of a second image of a stereo
6 image pair, the stereo disparity model distinguishing between non-fronto-parallel
7 matched pixels in each scan line and occluded pixels in each scan line.

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9 17. The computer program product of claim 16 wherein the computing
10 operation comprises:

11 computing matching costs for each pixel of each scan line pair.

12 18. The computer program product of claim 16 wherein the computing
13 operation comprises:

14 computing matching costs for each pixel of each scan line pair using a
15 windowed matching cost function.

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17 19. The computer program product of claim 16 wherein the computing
18 operation comprises:

19 altering the matching costs for at least one pixel pair based on whether the
20 pixel pair is determined to be associated with a non-fronto-parallel surface or an
21 occlusion.

22 20. The computer program product of claim 16 wherein the computing
23 operation comprises:

24 determining a minimum cost path in the stereo disparity model.
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1 21. The computer program product of claim 16 wherein the computing
2 operation comprises:
3 applying a cost penalty to a move from an occluded pixel pair to a matched
4 pixel pair.

5 22. The computer program product of claim 16 wherein the computing
6 operation comprises:
7 applying a cost penalty to a move from a matched pixel pair to an occluded
8 pixel pair.

9 23. The computer program product of claim 16 wherein the computing
10 operation comprises:
11 applying a cost penalty to a move from an occluded pixel pair to another
12 occluded pixel pair.

13 24. The computer program product of claim 16 wherein the computing
14 operation comprises:
15 applying a first cost penalty to a move from an occluded pixel pair to
16 another occluded pixel pair; and
17 applying a second cost penalty to a move from a matched pixel pair to an
18 occluded pixel pair, the first cost penalty being different than the second cost
19 penalty.
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21 25. The computer program product of claim 16 wherein the computing
22 operation comprises:
23 applying a first cost penalty to a move from an occluded pixel pair to
24 another occluded pixel pair; and
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1 applying a second cost penalty to a move from a matched pixel pair to an
2 occluded pixel pair, the first cost penalty being less than the second cost penalty.

3 26. The computer program product of claim 16 wherein the computer
4 process further comprises:

5 computing a cyclopean virtual image scan line based on corresponding
6 pixels of the scan lines of the first and second images, a disparity of the
7 corresponding pixels being characterized by a minimum cost path of the stereo
8 disparity model.

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10 27. The computer program product of claim 16 wherein the computer
11 process further comprises:

12 computing a cyclopean virtual image scan line based on corresponding
13 pixels of the scan lines of the first and second images, wherein corresponding
14 pixels that are matched are projected as a virtual pixel onto the cyclopean virtual
15 image scan line.

16 28. The computer program product of claim 16 wherein the computer
17 process further comprises:

18 computing a cyclopean virtual image scan line based on corresponding
19 pixels of the scan lines of the first and second images, wherein corresponding
20 pixels that are averaged to determined a value of a resulting virtual pixel on the
21 cyclopean virtual image scan line.

1 29. The computer program product of claim 16 wherein the computer
2 process further comprises:

3 computing a cyclopean virtual image scan line based on corresponding
4 pixels of the scan lines of the first and second images, wherein a non-occluded
5 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel
6 onto the cyclopean virtual image scan line from a background disparity in the
7 stereo disparity model.

8 30. The computer program product of claim 16 wherein the computer
9 process further comprises:

10 computing a cyclopean virtual image scan line based on corresponding
11 pixels of the scan lines of the first and second images, wherein a value of a non-
12 occluded pixel of an occluded pair of corresponding pixels is selected as a value of
13 a resulting virtual pixel on the cyclopean virtual image scan line.
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1 31. A system comprising:
2 a dynamic programming module computing a minimum cost path in a
3 stereo disparity model between a scan line of a first image and a corresponding
4 scan line of a second image of a stereo image pair, the stereo disparity model
5 distinguishing between non-fronto-parallel matched pixels in each scan line and
6 occluded pixels in each scan line.

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8 32. The system of claim 31 wherein the dynamic programming module
9 computes matching costs for each pixel of each scan line pair.

10 33. The system of claim 31 wherein the dynamic programming module
11 computes matching costs for each pixel of each scan line pair using a windowed
12 matching cost function.

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14 34. The system of claim 31 wherein the dynamic programming module
15 alters the matching costs for at least one pixel pair based on whether the pixel pair
16 is determined to be associated with a non-fronto-parallel surface or an occlusion.

17 35. The system of claim 31 wherein the dynamic programming module
18 determines a minimum cost path in the stereo disparity model.

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20 36. The system of claim 31 wherein the dynamic programming module
21 applies a cost penalty to a move from an occluded pixel pair to a matched pixel
22 pair.

1 37. The system of claim 31 wherein the dynamic programming module
2 applies a cost penalty to a move from a matched pixel pair to an occluded pixel
3 pair.

4 38. The system of claim 31 wherein the dynamic programming module
5 applies a cost penalty to a move from an occluded pixel pair to another occluded
6 pixel pair.

7 39. The system of claim 31 wherein the dynamic programming module
8 applies a first cost penalty to a move from an occluded pixel pair to another
9 occluded pixel pair and a second cost penalty to a move from a matched pixel pair
10 to an occluded pixel pair, the first cost penalty being different than the second cost
11 penalty.
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13 40. The system of claim 31 wherein the dynamic programming module
14 applies a first cost penalty to a move from an occluded pixel pair to another
15 occluded pixel pair and a second cost penalty to a move from a matched pixel pair
16 to an occluded pixel pair, the first cost penalty being less than the second cost
17 penalty.
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19 41. The system of claim 31 further comprising:

20 a cyclopean virtual image generator computing a cyclopean virtual image
21 scan line based on corresponding pixels of the scan lines of the first and second
22 images, a disparity of the corresponding pixels being characterized by a minimum
23 cost path of the stereo disparity model.
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1 42. The system of claim 31 further comprising:
2 a cyclopean virtual image generator computing a cyclopean virtual image
3 scan line based on corresponding pixels of the scan lines of the first and second
4 images, wherein corresponding pixels that are matched are projected as a virtual
5 pixel onto the cyclopean virtual image scan line.

6 43. The system of claim 31 further comprising:
7 a cyclopean virtual image generator computing a cyclopean virtual image
8 scan line based on corresponding pixels of the scan lines of the first and second
9 images, wherein corresponding pixels that are averaged to determined a value of a
10 resulting virtual pixel on the cyclopean virtual image scan line.

11 44. The system of claim 31 further comprising:
12 a cyclopean virtual image generator computing a cyclopean virtual image
13 scan line based on corresponding pixels of the scan lines of the first and second
14 images, wherein a non-occluded pixel of an occluded pair of corresponding pixels
15 is projected as a virtual pixel onto the cyclopean virtual image scan line from a
16 background disparity in the stereo disparity model.

17 45. The system of claim 31 further comprising:
18 a cyclopean virtual image generator computing a cyclopean virtual image
19 scan line based on corresponding pixels of the scan lines of the first and second
20 images, wherein a value of a non-occluded pixel of an occluded pair of
21 corresponding pixels is selected as a value of a resulting virtual pixel on the
22 cyclopean virtual image scan line.
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